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AUTHOR Nommay, Daniel E.
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ABSTRACT

This document focuses on published materials on the topic of the effects of family structure on intelligence and academic achievement from the last 15 years. Fourteen terms such as "birth order" and "spacing" are defined. Forty-five papers, published from 1973 to 1986, are annotated. Research results are summarized in the areas of family size, parents' input, spacing, birth order, tutoring effect, race, predicting Scholastic Aptitude Test score trends, family effects on verbal scores, and the predicting abilities of the confluence model on individuals. These summarizations are presented: (1) intellectual ability and educational achievement decreased as family size increased; (2) age of the individual affected birth order results; (3) family constellation effects appeared to have a greater impact on verbal than on non-verbal scores; (4) sex of the sibling had an impact on the tutoring effect with females being the greater benefactor; (5) confluence model faired poorly in accounting for racial differences in achievement test scores; and (6) parents' education, encouragement, and income contributed to the cognitive development of their children. It is recommended that an individual family should consider these findings and apply them to their situation when planning a family since families need to be aware of their own limitations; parents need to be aware which family variables shape the intellectual environment of their children. It is further recommended that educators need to stay aware of future research to understand the family's role in shaping a student's mental development. (ABL)

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THE EFFECTS OF FAMILY STRUCTURE ON INTELLIGENCE AND ACADEMIC ACHIEVEMENT

BY

DANIEL E. NOMMAY

Graduate Student

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
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CG 021139

A Study Directed

by

Charles R. DuVall, Ph.D.

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TABLE OF CONTENTS

	Page
INTRODUCTION	1
Statement of the Problem	1
Purpose of the Study	2
Organization of the Study	2
Limitations of the Study	2
Definition of Terms	3
ANNOTATIONS	4
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS	20
Summary	20
Conclusions	28
Recommendations	29
BIBLIOGRAPHY	30

INTRODUCTION

> "The family situation into which a child is born and over which it has no control may shape its intellectual destiny" (Steelman 355).

All of us have been born into some size and shape of family. We all have some birth order. Our interest in what influences human intelligence has intrigued man for centuries. It is no wonder, when a theory relates these ideas, that it rapidly gains attention and attracts much criticism and debate.

The most popular current theory of family influence is the confluence theory. It hypothesizes that a child is helped or hindered in cognitive development according to the intellectual environment of the family into which that child is born.

STATEMENT OF THE PROBLEM

The confluence model has received serious attention from educators because Zajonc (1976) has suggested that national declines in Scholastic Aptitude Test (SAT) scores merely reflect the movement of children from an era of relatively large families through the schools. Educators could feel quite relieved if patterns of declining intellectual achievement are attributable to demographic factors instead of faulty education. In light of current interest in the confluence theory and its predictions, it is important to examine the relationship of family characteristics to intellectual development.

PURPOSE OF THE STUDY

This paper is an annotated bibliography designed to be informative to parents and school personnel. The present research will explore the relation between family configuration and intelligence.

ORGANIZATION OF THE STUDY

The paper will concentrate on such components of family configuration as: family size, birth order, parental input, age-spacing between consecutive births, gender, and racial differences.

The annotations are arranged chronologically so that the research can be easily compared.

LIMITATIONS OF THE STUDY

Research of this topic was limited to information written within the last fifteen years. Though many opinions exist as to what effects differences in intelligence, this paper will be confined to a specific model.

DEFINITION OF TERMS

BIRTH ORDER- Sequence in which births occur in a family unit (ie.first born, second, last). Relative rank in terms of age of the siblings within a family.

CONFLUENCE MODEL- mathematical and psychological explanation of a child's intelligence as determined by the intellect of the family as a whole.

CONSTELLATION- The related group of family factors (ie. family size, birth order, spacing, SES level....).

DIFFERENTIAL BIRTH RATES-using birth rates as an indirect method in determining spacing within a family.

EDUCATIONAL ENCOURAGEMENT- how much the individuals were encouraged by parents and teachers to continue their education beyond high school.

GPA-grade point average.

INTELLECTUAL ENVIRONMENT-the cumulated average mental age of the family unit which includes the newborn.

ONLY-CHILDREN- The single child within a family.

ORDINAL- rank or position of birth within a family.

REPARAMETERIZED- refined to accommodate new data.

SES- socioeconomic status.

SIBSHIP-children in a family.

SIBSIZE-(family size) Total number of children in a family.

SPACING- The number of years separating consecutive children in a family.

ANNOTATIONS

Belmont, Lillian, and Francis A. Marolla. "Birth Order, Family Size, and Intelligence." Science 182 December 1973: 1096-1101.

Belmont and Marolla used the Raven Progressive Matrices to test all 386,114 19-year-old males born between 1944 and 1947 in the Netherlands and found that first-borns scored higher than second-borns and so on successively. The effects of birth order held, regardless of the SES level. The only-child, who by trend should have scored highest, scored equal to a first-born of a four-child family. The authors also found that larger family sizes were associated with lower intelligence scores. These findings were more pronounced in the manual and nonmanual SES groups and less pronounced in the farm group.

Lindert, Peter A. "Family Inputs and Inequality Among Children." (Discussion Papers No. 218-74, Wisconsin University.) Microfiche. Sponsored by Madison Institute for Research on Poverty, October 1974. (ED 102 234)

This report studied the effects of family structures on educational attainment, as it pertains to the number of years of schooling. Schooling levels decreased with larger family sizes, closer-spaced births, one-parent households, lower levels of parental education, and occupation. Gender was not found to be a determining factor in educational attainment. Lindert found that first-borns and last-borns did better than middle-borns, and that these differences increased as spacing intervals increased. His research showed that the youngest of four received more attention than the youngest of three, in part because the first-borns were often old enough to help care for the fourth child.

Breland, Hunter M. "Birth Order, Family Configuration, and Verbal Achievement." Child Development 45 (1974): 1011-1019.

Breland studied the test-taking performance of 800,000 National Merit Scholarship participants in grades ten through twelve. He found, when studying these gifted students, that early-born children and those from small families excelled over their counterparts. He also found that twins and only-children scored lower than children in a two-child family. The test scores declined with increasing births. The exception was when there were large spacing gaps (three or more years) between siblings which canceled the negative effects of birth order. Scores were lower for children from single-parent homes. These findings existed regardless of family income, sex of the siblings, or parental education.

Zajonc, R. B., and Gregory B. Markus. "Birth Order and Intellectual Development." Psychological Review 82 January 1975: 74-88.

The authors devised a mathematical model which they believed explained a number of earlier findings. Called the confluence model, it centered around the fact that the family influenced a child's intellectual level. As the family grew in number, the intellectual environment declined. Intelligence decreased as the child's ordinal position increased. Closely-spaced siblings were at a disadvantage compared to widely-spaced children.

Cicirelli, Victor G. "Sibling Structure and Intellectual Ability." Developmental Psychology 12 (1976): 369-370.

A number of family variables were studied to determine which factors affected the IQ scores of children aged 11 and 12. Cicirelli found that as family size increased, IQ scores declined. The parents' occupational level was not found to be the reason for this relationship. The only-child's scores were below that of a child in a two-child family. There was no birth order relationship found, nor was there a noticeable drop in scores for last-born children.

Zajonc, R. B. "Family Configuration and Intelligence." Science 192 April 1976: 227-236.

Zajonc studied four large datasets and concluded that inconsistent birth order findings were due to differential birth rates. His research showed that there were negative birth order effects in high birth rates but not in low birth rate samples. Also, the higher birth rates were associated with shorter spacing intervals between siblings. He put the two ideas together to arrive at the conclusion that birth order effects were due entirely to spacing. Zajonc claimed that the changes in family structure (larger families) could be part of the reason for the decline in SAT scores over the last two decades. He went on to predict that since the trend in family size has declined since 1962, there would be an upward trend in SAT scores by 1980.

Lewis, Michael, and Howard Gallas. "Cognitive Performance in the 12-Week-Old Infant: The Effects of Birth Order, Birth Spacing, Sex, and Social Class." Microfiche. Educational Testing Service, Princeton, New Jersey. August 1976. (ED 160 233)

This report was based on the effects of such variables as the child's sex, SES level, birth order, and birth spacing on the IQ of 189 three-month-old infants. Results showed a birth order difference with first-borns achieving the highest scores. No significant gender, birth spacing, or SES differences were found.

Nuttall, Ena V., Ronald L. Nuttall, Denise Pollt, and Joan B. Hunter. "The Effects of Family Size, Birth Order, Sibling Separation and Crowding on the Academic Achievement of Boys and Girls." American Educational Research Journal 13 Summer 1976: 217-223.

The authors studied such family constellation variables as family size, birth order, and spacing of children, on academic achievement while controlling IQ. The intent of the authors, in controlling intelligence, were to determine if earlier family configuration findings in favor of smaller sibling numbers and earlier-borns were due to higher intelligence or family structure. The findings indicated that family constellation variables were associated with academic achievement but they were sex-biased. Birth order effects were found for females. School grades of first-born females were significantly higher than those of later-born females but there were no significant birth order effects upon grades among males. The authors interpreted this to mean, by adolescence, females benefit more from the teaching effect than males. Males were affected by family size, obtaining better grades when family sizes were smaller. Sibling spacing proved to be non-significant in predicting academic achievement when IQ was controlled.

Kunz, Phillip R., and Evan T. Peterson. "Family Size, Birth Order, and Academic Achievement." Social Biology 24 (1977): 144-148.

The authors faulted earlier research on family configuration effects in that SES levels were not always controlled. They pointed out that since large families tend to be from lower SES levels, negative family size findings could be due to SES rather than the size of the family. Kunz and Peterson tested the effects of family structure on academic achievement while controlling for social class of the father. Prior to SES control, results showed that the student's grade point average decreased as family size increased. The exception was the only-child which had the lowest GPA. There appeared to be a parabolic relationship in the case of birth order in which the low and high birth orders scored higher than the middle birth orders. However, both of these relationships disappeared when SES was controlled.

Olneck, Michael R., and David B. Bills. "Family Characteristics and Achievement: Effects of Birth Order and Family Size of the Kalamazoo Brothers Sample. (Paper presented at the Mathematical Social Science Board Conference on Family Environment and Subsequent Child Development.) Microfiche. Stanford, California, August, 1977. (ED 147 437)

Using 274 pairs of brothers, the authors studied the effects of birth order within families. The boys were tested when they reached the sixth grade during the period between 1928 to 1950. Birth order effects on intelligence scores were inconsistent and weak. Also, there were no birth order effects on educational attainment found. Even allowing the effects of birth order to vary by age-spacing did not vary the results. Family size effects were significant even with SES controlled.

Cicirelli, Victor G., "Children's School Grades and Sibling Structure." Psychological Reports 41 (1977): 1055-1058.

Cicirelli studied the relationship between birth order, sex of the child, sex of its sibling, and GPA for 160 sixth-graders of two-child families. There was a significant gender difference in that females received higher grades than males. He found that birth order was not a good predictor in itself when family size was held constant. There was, however, a significant relationship between birth order and siblings' sex. First-borns scored higher if their sibling was female, whereas second-borns scored higher if their sibling was male.

Breland, Hunter M. "Family Configuration Effects and the Decline in College Admissions Test Scores: A Review of the Zajonc Hypothesis." (Prepared for the Advisory Panel on the Scholastic Aptitude Test Score Decline) Microfiche. Sponsored by Educational Testing Service, Princeton, New Jersey, January 1977. (ED 148 863)

Breland researched Zajonc's (1976) contention that recent changes in family configurations caused a decline in SAT scores. Breland's findings showed that family configurations could only account for a small percentage of the decline in SAT scores. Breland suggested an unknown "intervening variable" could have been the reason for the SAT score decline. He claimed that it was just by chance that there were demographic changes at the same time as the decline in achievement scores.

Grotevant, Harold D., Sandra Scarr, and Richard A. Weinberg. "Intellectual Development in Family Constellations with Adopted and Natural Children: A Test of the Zajonc and Markus Model." Child Development 48 (1977): 1699-1703.

In this article the authors' intent was to test the confluence model's ability to predict individual datum. They studied a sample of individual families with adopted and biological children. This research was unique in that the authors obtained intelligence scores of entire families (something required for the confluence model but never before used) and then used the confluence model to predict children's intelligence from parents' scores, family size, and sibling spacing. There was also the unique possibility that three children in a family could have all been first-borns by different mothers, a test of genetic importance. The confluence model fared poorly in its predictions of children's IQ. The study showed that adopted children were not affected significantly by confluence factors where natural children were which suggests that heredity, at least partially, influenced sibling factors.

Bahr, Stephen J., and Geoffrey K. Leigh. "Family Size, Intelligence, and Expected Education." Journal of Marriage and the Family 40 May 1978: 331-335.

Bahr and Leigh were interested in determining which family factors influenced intelligence and educational attainment. The factors tested were family size, parental education, SES level, and educational encouragement. Educational encouragement was defined as how much the individuals were encouraged by parents and teachers to continue their education beyond high school. Results showed that family size had little effect on intelligence or educational attainment once the parents' occupation, education, and income were controlled. The authors claimed that findings from previous studies showing lower intelligence among larger families were a result of poor controls. The strongest predictor of intelligence and educational attainment found in this study was educational encouragement. There was a slight positive relationship between parents' education and intelligence.

Fowler, Patrick C., and Herbert C. Richards. "Father Absence, Educational Preparedness, and Academic Achievement: A Test of the Confluence Model." Journal of Educational Psychology 70 (1978): 595-601.

This study focused on 120 low-income black children at the beginning of their formal education to see what affects the father's presence or absence had on their academic achievement. Three achievement scores were obtained while the subjects were in second grade. Findings showed no significant differences between father-present and father-absent subjects. This finding held regardless of gender.

Belmont, Lillian, Zena Stein, and Patricia Zybert. "Child Spacing and Birth Order: Effect on Intellectual Ability in Two-Child Families." Science 202 December 1978: 995-996.

The authors identified a subsample of men in two-child families from the Netherlands sample (Belmont and Marolla 1973). The study focused on two components of the confluence model: 1) as spacing increases, the birth order effect on intelligence ceases to favor first-borns and could even favor the second-born; and 2) as spacing increases both first-born and second-born benefit. The findings were unable to prove that intelligence is influenced by the spacing length between first- and second-born males.

Nuttall, Ena V., and Ronald L. Nuttall. "Child-Spacing Effects on Intelligence, Personality, and Social Competence. The Journal of Psychology 102 (1979): 3-12.

This study focused on family size and spacing effects. Intelligence scores for these teenagers, ranging in age from 13 to 18, were obtained from school records. The findings showed that the more closely-spaced younger child was less intelligent. These findings were more pronounced in the larger families than in the two-child families. The child tended to be more intelligent as the spacing distance increased in the larger families.

Barnes, Jonathan, James Fisher, and Michael Palmer. "Family Characteristics and Intellectual Growth: An Examination by Race." Educational and Psychological Measurement 39 Fall 1979: 625-636.

The authors tested the effects of birth order, SES level, family size, parental absence, and spacing lengths on IQ scores of fifty-six black and fifty-two white first through fifth-graders. The authors pointed out that blacks had larger families and more one-parent households which should lead to slower intellectual growth according to the confluence model. The findings of the group as a whole were as predicted by the model. The IQ scores decreased for higher birth orders, lower SES levels, closer-spaced siblings, one-parent families, and for larger families. When these same family characteristics were examined by race, they were not able to account for the racial differences in intelligence test scores.

Olneck, Michael R., and David B. Bills. "Family Configuration and Achievement: Effects of Birth Order and Family Size in a Sample of Brothers." Social Psychology Quarterly 42 (1979): 135-148.

Olneck and Bills studied their same sample (1977) of 247 pairs of brothers. They tested the effects of birth order and family size on intelligence and academic achievement. Achievement scores from sixth grade aptitude tests were used. They found no significant birth order effects for this age group. The authors did find that there were larger scores from smaller families. They went on to test to see if these family size differences were due to economic rather than psychological reasons. The effects of family size did not diminish when SES was controlled.

Edwards, R. P., and Kathleen Thacker. "The Relationship of Birth-Order, Gender, and Sibling Gender in the Two-Child Family to Grade Point Average in College." Adolescence 53 Spring 1979: 111-114.

Edwards and Thacker studied the effects of birth order, gender, and sibling gender on the grade point average of 326 college freshmen in two-child families. The only significant findings were gender related with females receiving higher GPA's than males.

Galbraith, Richard C., and James E. Smith. "Sibling Spacing and Academic Achievement: A Within-Family Perspective." (Paper presented at the meeting of Society for Research in Child Development, San Francisco, California) Microfiche. March 15-18, 1979. (ED 168 726)

The authors tested the claim that long birth intervals diminished the impact of birth order. Galbraith and Smith found that the confluence model demanded unrealistic age differences between siblings to counter the negative effects of spacing (an average spacing interval of 16 years between births). The authors went on to study their own sample of Brigham Young University students and found no increase in ACT scores with increased spacing lengths.

Zajonc, R. B., Hazel Markus, and Gregory B. Markus. "The Birth Order Puzzle." Journal of Personality and Social Psychology 37 (1979): 1325-1341.

A "reparameterized" version of the confluence model was presented in this article to explain the conflicting and inconsistent birth order findings. The refined version predicts a negative birth order effect for young children, a positive birth order effect for children aged 4 to 9, an absence of an effect between ages 9 to 12, and gradually increasing negative effects thereafter. This study examined 125,000 French school children aged 6-13. The revised confluence model was able to accurately predict the IQ test scores of these students.

Rankin, Richard J., A. J. H. Gaite, and Thomas Heiry. "Cultural Modification of Effect of Family Size on Intelligence." Psychological Reports 45 (1979): 391-397.

These authors concluded, from their findings, that the relationship between family size and intelligence was culturally dependent. In studying American-Samoan families, where large families are the norm, they found that families near average size (6.46) were more intelligent than those at the extremes.

Page, Ellis B., and Gary M. Grandon. "Family Configuration and Mental Ability: Two Theories Contrasted with U.S. Data." American Educational Research Journal 16 Summer 1979: 257-272.

Page and Grandon tested different family sizes of two races and three social classes. They claimed if race and SES were controlled the family size-birth order predictability diminished. The effects of family size on intelligence were smaller in the high SES group. Page and Grandon's research of 10,662 high school graduates showed that pooling the subpopulations caused a greater decline in test performance than any of the SES or race subpopulations studied individually.

Mascie-Taylor, Nicholas C.G. "Family Size, Birth Order, and IQ Components: A Survey of a Cambridge Suburb." Journal of Biosocial Science 12 (1980): 309-312.

This study examined the relationship between birth order, family size, and IQ of both manual and non-manual social groups. The results showed an increase in IQ scores in the small manual families and the opposite result in the non-manual families. The group as a whole showed no relationship between family size and IQ scores. The overall group study showed a negative birth order-IQ relationship but a positive relationship when just the non-manual social group was studied.

Melican, Gerald J., and Leonard S. Feldt. "An Empirical Study of the Zajonc-Markus Hypothesis for Achievement Test Score Declines." American Educational Research Journal 17 Spring 1980: 5-19.

The hypothesis that the decline in SAT scores since the mid-1960's were due to the trend toward larger, closer-spaced families was tested in this study. The results of Melican and Feldt's study did not confirm that population trends account for changes in achievement scores. The authors findings showed a weak relationship between child-spacing and intellectual performance. Only a modest difference was found between the average birth intervals from the time of Zajonc's study to the present study. Melican and Feldt studied families with two to five siblings and age-spacing was found to be a predictive variable for intellectual performance in only the three-child families.

Tremans-Ziremba, Malonie, Julian Michayluk, and Lorne Taylor. "An Examination of Some Predictors of Reading Achievement in Grade Four Children." Reading Improvement 17 Winter 1980: 260-266.

A number of factors were tested to determine which influenced reading ability scores. Among them were sex, intelligence, SES level, and birth order. A version of the Iowa Basic Skills was administered to the 143 subjects tested in grade four. Age and IQ were the only two factors that were strong predictors of reading ability. The belief that first-borns tend to achieve better was not supported in this study.

Zajonc, R. B., and John Bargh. "The Confluence Model: Parameter Estimation for Six Divergent Data Sets on Family Factors and Intelligence." Intelligence 4 (1980): 349-361.

The reparameterized version of the confluence model was tested on six national surveys of intelligence to determine its prediction capability. Census birth rate data were used to estimate the spacing between births. If the birth rate was low at the time of the study then the authors assumed a greater number of years between births. Zajonc and Bargh concluded that the confluence model was capable of predicting aggregate data from widely different populations.

Pfouts, Jane H. "Birth Order, Age-Spacing, IQ Differences, and Family Relations." Journal of Marriage and the Family 42 August 1980: 517-531.

Pfouts studied the relationship between birth order and the performance in school of thirty-seven pairs of brothers. There were three groups studied; one with the eldest brother having the higher IQ, both brothers having the same IQ, and the youngest having the higher IQ. The findings showed a negative birth order effect in all three studies. Surprisingly, the first-borns scored better in school than their more able younger sibling. Closer-spaced siblings scored lower than the wider-spaced brothers.

Steelman, LaLa Carr, and James A. Mercy. "Unconfounding the Confluence Model: A Test of Sibship Size and Birth-Order Effects on Intelligence." American Sociological Review 45 August 1980: 571-582.

As family size increased, IQ scores declined in this study. The only-child exception appeared for children which were below the poverty line. According to the confluence model, the last-child should score lower because of the lack of the tutoring effect. The opposite was found true. Birth order effects failed to appear in either high or low SES groups. Steelman and Mercy tested to see if there were any IQ differences across classes when mothers worked. It was only in the high SES group that the mother's continual presence related positively to IQ. Income and family size, in that order, were found to be the two greatest predictors of IQ scores. The confluence model had its greatest predictability value at the low SES level for this sample of 6 to 11 year-olds.

Svanum, Soren, and Robert G. Bringle. "Evaluation of Confluence Model Variables on IQ and Achievement Test Scores in a Sample of 6- to 11-Year-Old Children." Journal of Educational Psychology 72 (1980): 427-436.

Svanum and Bringle found that as family size increased, testing ability decreased. The study failed to confirm confluence predictions about spacing and ability and failed to find any relationship between birth order and intelligence despite using age-related refinements. The authors found SES level and family size, in that order, were significant predictors of intellectual development and educational achievement.

Paulhus, Delroy, and David R. Shaffer. "Sex Difference in the Impact of Number of Older and Number of Younger Siblings on Scholastic Aptitude." Social Psychology Quarterly 44 (1981): 363-368.

The authors tested the possibility of a gender difference in relation to family size and SAT scores by studying 1,811 college freshmen. The results showed a decline in SAT score for males as family size grew larger. A finding contrary to confluence predictions showed females did better as the family size grew larger.

Galbraith, Richard C. "Sibling Spacing and Intellectual Development: A Closer Look at the Confluence Models." Developmental Psychology 18 March 1982: 151-173.

Galbraith's study of student's ACT scores at Brigham Young University failed to achieve the typical negative family size relationship. Strangely, he found a slightly positive influence of family size on intelligence while studying this older-aged sample. A negative birth order impact was found which showed scores declining slightly with birth order. Galbraith found minor differences in test performance with respect to spacing. He found it was necessary to have a spacing difference of approximately fifteen years in order to see a one point ACT score increase.

Mercy, James A., and LaLa Carr Steelman. "Familial Influence on the Intellectual Attainment of Children." American Sociological Review 47 (1982): 532-542.

This study of 6 to 11 year-olds showed that the mother's education had a greater impact on the child's intellectual development than the father's education. The educational level of parents reflected the degree of intellectual stimulation in the home. This study also looked into how time spent by children could influence their intelligence. Results showed that time spent with peers of the same age dampened intellectual growth. Time spent by older siblings taking care of younger ones could discourage them from engaging in more intellectual activities. Most of the effects observed in this study had more pronounced effects on verbal than nonverbal ability.

Steelman, LaLa C., and James A. Mercy. "Sex Differences in the Impact of Sibsize on I.Q. Performance." Social Psychology Quarterly 46 (1983): 157-162.

The authors studied the IQ performance of a large, nationally representative sample of children ages 6 to 11. They were particularly interested in studying the hypothesis that there was a positive relationship between the number of younger siblings and the intelligence scores for females. They failed to find a gender difference in relation to family size and intelligence. Because of the young sample studied, Steelman and Mercy did further tests and found that as the group got older the presence of younger siblings caused a negative impact on test performance with females.

Lewis, Michael, and John Jaskir. "Infant Intelligence and Its Relation to Birth Order and Birth Spacing." Infant Behavior and Development 6 (1983): 117-120.

Lewis and Jaskir investigated the relation of birth order and birth spacing to intelligence. Infants were tested at 3, 12, 24, and 36 months of age. The authors found significant birth order effects. Intelligence scores decreased as birth order increased. There were no consistent patterns found between spacing and IQ scores.

Steelman, LaLa Carr., and John T. Doby. "Family Size and Birth Order as Factors on the IQ Performance of Black and White Children." Sociology of Education 56 April 1983: 101-109.

In this article the authors studied family size and birth order effects on verbal and nonverbal IQ performance across racial subgroups. They contended that earlier findings in support of the confluence model may have been "artificially inflated" since blacks and lower SES levels have done less well on standardized tests compared to white middle-class SES levels. Blacks tend to be from larger families. There was no support that birth order was a reliable predictor of verbal or nonverbal performance for either race in this sample of 6 to 11 year-olds. The typical decline in IQ with increasing family size appeared for both blacks and whites for verbal IQ performance only. This negative family size impact did not vary by race. The only-child exception was not found to be true for blacks and only slightly for whites on the vocabulary test alone.

Smith, Thomas E. "School Grades and Responsibility For Younger Siblings: An Empirical Study of the Teaching Function" American Sociological Review 49, (1984): 248-260.

Smith set out to test two hypotheses: 1) females would benefit more from having younger siblings than would males and 2) that school grades would be negatively associated with number of older siblings. The findings showed that females did report higher grades and had more responsibilities for younger siblings than males but the findings did not indicate that one was due to the other. Smith was surprised to find a race difference. Grades for blacks were highest when they had no sibling responsibilities and decreased with increasing responsibilities. Findings showed a curvilinear relationship for the grades of white children. Grades were highest among those with a moderate frequency of responsibility and declined at either extreme. In the second area tested, there was a negative relationship between grades and number of older siblings for whites but not for blacks. Grades of white children decreased with each increase in number of older siblings.

Lancer, I., and Y. Rim. "Intelligence, Family Size and Sibling Age Spacing." Personality and Individual Differences 5 (1984): 151-157.

Lancer and Rim found, in all three SES classes studied, that as family size increased there was a decline in intelligence scores (both verbal and nonverbal). This was most pronounced at the low SES level. The closer-spaced and higher the birth order position the lower the intelligence score. The results showed the negative effects of birth order were weakened or eliminated when spacing was large. Verbal intelligence was most affected by age-spacing. The average score went down the lower the SES level.

McCall, Robert B. "Developmental Changes in Mental Performance: The Effect of the Birth of a Sibling." Child Development 55 August 1984: 1317-1321.

The birth of a younger sibling associated with a decline in IQ performance was the one aspect of the confluence model tested in this study. McCall compared the relative changes in IQ scores over time in only-children, children with an older sibling, and those with a younger sibling. He found those with younger siblings experienced a greater decline in IQ performance. The study showed that two years after the birth of a sibling, the IQ of the older child dropped ten points. However, when subjects reached age 17, the differences were nonsignificant.

Steelman, LaLa Carr, and Brian Powell. "The Social and Academic Consequences of Birth Order: Real, Artifactual, or Both?" Journal of Marriage and the Family 47 February 1985: 117-124.

The authors attempted to rectify what they felt to be shortcomings in past research, two of which were previously small sample sizes and narrow age groups. The study consisted of two large samples, children ages 6 to 11 and teenagers ages 12 to 17. In every case, a child from a large family underperformed those from a small family. Birth order had no influence on academic performance in either age group. Birth order would have been significant had family size not been controlled, but the impact of the number of siblings influenced the birth order results. The authors also tested the impact of birth order for males and females separately and found neither sex were influenced by birth order in terms of academic success. The results were consistent for both children and teenagers. The only-child exception was observed in children ages 6 to 11.

Hauser, Robert M., and William H. Sewell. "Birth Order and Educational Attainment in Full Sibships." American Educational Research Journal 22 Spring 1985: 1-23.

This article focused on the effects of family structure on educational attainment as measured by the number of years of schooling. Prior to controlling SES levels, the results showed an inverse relationship between birth order and educational attainment in every family size. This finding disappeared when SES was controlled. The amount of postsecondary schooling decreased as family size increased. Only-children were neither at an advantage or disadvantage in this aspect compared to children in small families.

Polit, Denise F., and Toni Falbo. "Siblings and Child Development: Evidence from a Meta-Analysis of the Literature on Only Children." (Based on a paper presented at the meeting of the Society for Research in Child Development.) Microfiche. Toronto, Ontario, Canada 1985. (ED 256 510)

The authors found that an only-child disadvantage did not exist regardless of family size or birth order as suggested in the confluence model. The findings showed that only-children were similar in intelligence to a child in a two-child family and higher than those from families with three or more children. The authors pointed out that a possible explanation for the discrepancy in these findings with the confluence model's tutoring hypothesis was that this study included IQ data from a wide range of ages (preschool to adult) where most studies, which have found an only-child disadvantage, have subjects no younger than adolescents.

Zajonc, R. B. "The Decline and Rise of Scholastic Aptitude Scores: A Prediction Derived From the Confluence Model." American Psychologist 41 August 1986: 862-867.

In this article Zajonc studied SAT scores and pointed out that the confluence model accurately predicted the upward trend ten years ago. The scores were predicted to decline until family size decreased in 1980, at which time the scores would begin to rise. Zajonc went on to predict that a continued decline in family size should result in a rise in SAT scores until the year 2000, at which time a leveling off and decline is expected thereafter. Zajonc predicted that the average SAT scores would be between 510 and 515 by the turn of the century.

Forehand, Rex, Nicholas Long, Gene H. Brody, and Robert Fauber. "Home Predictors of Young Adolescents' School Behavior and Academic Performance." Child Development 57 December 1986: 1528-1533.

The authors studied the relationship of home variables with success in school of 11 to 15 year-olds according to their grade point averages. Among the findings it was determined that as birth order increased the grade point averages decreased.

SUMMARY

FAMILY SIZE

Zajonc and Markus formulated the confluence model in response to studies which showed that family size and birth order were inversely related to intellectual ability. They claimed that the most favorable intellectual climate was experienced by children from small families, older children, and distantly spaced children (85).

Each additional child resulted in a decline in the family's intellectual level. McCall discovered that older siblings could experience as much as a ten point drop in their intelligence scores following the arrival of a newborn (1320). A notable exception to this family size trend was seen in a study done at Brigham Young University which showed an increase in ACT scores with larger families (Galbraith 167). This study was later criticized as being a nongeneralized sample since it was composed of Mormons, who have different child-rearing practices and an economic situation which could offset the disadvantage of a large family (Zajonc 469).

Although the research indicates the only-child should score higher than a child with siblings and the last-born should score lowest in the family, this was not always the case. To explain why these two groups deviated from the linear decline in ability tests, Zajonc and Markus added another factor to the confluence model: the tutoring

explanation (83). Neither the only-child nor the last-child has a younger sibling to teach. Not all research found this tutoring explanation to be true. Hauser and Sewell found only-children were neither at an advantage or disadvantage in this aspect compared to children in small families (10). Polit and Falbo found it, in some cases, an advantage being an only-child with respect to intelligence, and educational achievement (5). The findings of higher scores in last-borns at low SES levels, led some researchers to believe that the only-child was more at a disadvantage due to a lack of interaction with peers than the lack of a tutoring effect (Steelman and Mercy 581).

A number of studies have demonstrated that the relationship between family size and mental test performance of children is better explained as a function of economic (SES) rather than family size differences (Bahr and Leigh 331; Kunz and Peterson 147; Mascie-Taylor 310). Steelman and Mercy found family size effects to be less pronounced at the high SES level where they felt the cost of additional children could be more easily absorbed (580). While other studies found that the effect of family size did not diminish when SES was controlled (Breland 1012; Olneck and Bills 144).

Mercy and Steelman (540) felt that the way a family spent its time was a possible explanation for the decline in intelligence. Their findings showed that larger families are more inclined to spend less time reading, more time with

peers, and there is less likelihood of attending kindergarten or nursery school.

PARENTS INPUT

Steelman and Mercy found that only high SES children benefited by having a non-working mother. They suggested that the mother at the high SES level was possibly more apt to possess knowledge and skills to put her at an advantage (577).

According to the confluence model, an absence of an adult family member should decrease the family's intellectual environment and thus should cause a decrease in scholastic achievement. Studies of single-parent families showed a decrease in educational attainment (Lindert 28) and lower National Merit Scholarship scores (Breland 1017). Fowler and Richards, on the other hand, were unable to find any differences in test scores between father-present and father-absent families in their young sample (597).

SPACING

Zajonc's argument was that wide age-spacing permitted an older sibling to enjoy an undiluted atmosphere longer and provided a younger sibling with a more mature environment (231). Breland claimed that twins scored lower on standardized tests due to their close spacing (1015). Ironically, the same study that played a key role in the conception of the confluence model was unable to show that

intelligence was influenced by the spacing length between siblings (Belmont, Stein, and Zybert 996).

Some authors found the confluence model's spacing lengths to be unrealistic. Galbraith found it was necessary for a family to have an average spacing difference of approximately fifteen years in order to see a one point ACT score increase (168). Likewise, Galbraith and Smith found that the confluence model demanded unrealistic age differences claiming that most parents would be beyond their childbearing years before a third child could be born within the estimated time frame (7). Even findings among the same authors were inconsistent. One study showed that spacing was not significant in determining academic achievement when IQ was controlled (Nuttall et al. 222). However, in a later study, Nuttall and Nuttall showed that the more closely-spaced younger child was less intelligent (7).

BIRTH ORDER

Breland (1014) found that test scores decreased as birth order positions increased unless there were large spacing gap between siblings. The confluence model was then derived with the idea that family size and age-spacing were the two family characteristics involved most in intellectual development. Birth order was an artifact of age-spacing rather than a variable in its own right (Zajonc and Markus 83). Zajonc explained that the higher birth rate meant shorter spacing between siblings and "when birth intervals

are longer, the negative impact of birth order lessens, vanishes, or even reverses" (234).

Birth order studies done within the next few years showed many inconsistencies. It was obvious that spacing was not the only factor involved. Zajonc, Markus, and Markus observed that birth order effects occurred in some samples but not others and it was in the revised confluence model which they stated that birth order was age-related. They claimed that the inconsistencies were with children tested between the ages 3 to 13. These ages generally showed no birth order effect or positive effects because the first-born's intellectual environment would be reduced with the birth of the second-born. The age period from 11 to 13 was defined as a transition or "crossover" period and the research would result in mixed findings because the teaching function would require a period of years before it reflected an increase in the first-born's intelligence (1333). The studies showing the absence of a significant birth order effect were studies from populations under 13 years of age (Cicirelli 1077; Steelman and Mercy 576; Svanum and Bringle 433; Steelman and Doby 106; Tremans-Ziremba 262).

The revised confluence model stated that children tested younger than age 3 or older than 14 showed declines in scores with birth order. Among those who found a negative birth order effect came from populations who were at least 14 years old (Belmont and Marolla 1100; Breland 1012; Galbraith 167; Page and Grandon 267). Two studies of

infants did show a negative birth order effect (Lewis and Gallas 13; Lewis and Jaskir 118).

THE TUTORING EFFECT -- GENDER RELATED ?

Lindert found that the youngest of four received more attention than the youngest of three, in part because the older siblings were old enough to help care for the young (21). There were some studies in this research that showed that the tutoring effect may be gender related. When Paulhus and Shaffer revealed an increase in achievement test scores in females with larger families they hypothesized that females would profit from the presence of younger siblings. They believed that females were more likely than males to be assigned childtending responsibilities and thus were more likely to benefit from the teaching effect. In testing further, they confirmed that the eldest female did actually benefit the most (367). Nuttall, Nuttall, Polit, and Hunter found that school grades of first-born females were significantly higher than those of later-born females, but there were no significant birth order effects upon grades among males. Likewise, the authors interpreted this to mean, by adolescence, females benefit more from the teaching effect than males (220).

Mercy and Steelman felt that time spent by older siblings taking care of younger ones could discourage them from engaging in more intellectual activities (540). They failed to find a gender difference in relation to family

size and intelligence (Steelman and Mercy 159). Smith also reported females achieving higher grades and had more responsibilities for younger siblings than males but the findings did not indicate that one was due to the other (257).

RACE

Despite the fact that Blacks generally were from larger families, closer-spaced, and had younger mothers, the confluence model was unable to account for racial differences in test scores (Barnes et al. 630; Page and Grandon 263; Steelman and Doby 108). The lack of a similar relationship prompted Smith to suggest that family size and birth order have less effect upon blacks than among whites (255).

PREDICTING SAT SCORE TRENDS

Zajonc (233) stated that shifts in family structures might account for the steady decline in SAT performance. Breland disputed this, finding no strong correlation between SAT scores and the rise in family sizes. He attributed the decline to some other unknown variable (11). Melican and Feldt's study also could not confirm that population trends accounted for changes in achievement scores (15). Following the 1980 test results, Zajonc claimed that the confluence model was able to accurately predict changes in achievement

scores and went on to make future predictions on SAT trends (867).

FAMILY EFFECTS GREATER ON VERBAL SCORES

The first-born is often called upon to play a parent-surrogate role relative to later-borns. Such a role would enhance the development of verbal skills. Many studies in this paper found that verbal scores were most affected by family variables (Breland 1012; Lancer and Rim 153; Mercy and Steelman 539; Steelman and Doby 107).

INDIVIDUAL STUDIES

A few studies attempted to try the predicting abilities of the confluence model on individuals. Page and Grandon pointed out that individual predictions were generally of greater interest to psychologists and educators than predictions for aggregated groups. They found the confluence model to be a good predictor for large samples but fared poorly when individual samples were studied (270). Melican and Feldt discovered there was a more pronounced family configuration effect on the entire population than on any one subpopulation (17).

CONCLUSIONS

Although studies of family constellation effects on intellectual abilities and achievement have not resulted in findings that are entirely consistent, a number of generalizations can be drawn.

The most convincing evidence found in this research was that intellectual ability and educational achievement decreased as family size increased. One-child families were the exception with lower scores than expected for its size. The negative influence of family size on the intellectual level was more moderate in high SES groups.

The age of the individual effected birth order results. By age 14 the child was less negatively effected by a newborn and at an age to have received the benefits gained by the tutoring effect. Spacing distances also effected results, with closer-spacing decreasing the negative birth order findings.

Another consistency from the research showed that the family constellation effects appeared to have a greater impact on verbal than non-verbal scores.

The sex of the sibling had an impact on the tutoring effect with females being the greater benefactor. Females, from the majority of the research, appeared to be placed in a situation of greater responsibility and this was associated with higher intelligence scores.

The confluence model fared poorly when trying to account for the racial differences in achievement test

scores. Despite differences in black family configurations, the model was unable to account for their lower intelligence scores.

The parents' education, encouragement, and income contribute to the cognitive development of their offspring.

RECOMMENDATIONS

In light of the present research, an individual family should consider these findings and apply it to their own situation when planning a family. Each family unit has its own limitations and parents need to be aware of which family variables play a part in shaping the intellectual environment of their children.

Educators can benefit from these findings and need to stay aware of future research in this area in order to better understand the family's role in shaping a student's mental development.

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